The Magic of Monte Carlo

Speaker: Jeffrey S. Rosenthal
Time: Tuesday, April 24, 4:00 p.m.
Location: CMC 206

Monte Carlo algorithms use repeated randomness to approximately compute complicated high-dimensional quantities. They are frequently applied to such diverse areas as Bayesian statistics, physical chemistry, medical research, financial modeling, numerical integration, and more. Using simple graphical simulations, and analogies to casino gambling and coin flipping and public opinion polls, this talk will explain how these algorithms work, and why they are so useful.

Jeffrey S. Rosenthal is a professor in the Department of Statistics at the University of Toronto. He received his BSc from the University of Toronto at the age of 20; his PhD in Mathematics from Harvard University at the age of 24; and tenure in the Department of Statistics at the University of Toronto at the age of 29. For his research, he was awarded the 2006 CRM-SSC Prize, and also the 2007 COPSS Presidents’ Award, the most prestigious honor bestowed by the Committee of Presidents of Statistical Societies. For his lecturing, he received a Harvard University Teaching Award in 1991, and an Arts and Science Outstanding Teaching Award at the University of Toronto in 1998. Rosenthal is also the author of the bestselling book “Struck by Lightning: The Curious World of Probabilities”, and maintains the web site www.probability.ca.

Summer 2012 Employment Opportunities

The Center for Talented Youth (CTY) is still looking for applicants interested in summer employment as an Instructor or Teaching Assistant. CTY offers challenging academic programs, at 24 locations on the East and West Coasts, for highly talented elementary, middle, and high school students from across the country and around the world.

Dates:
Session 1: June 21 - July 14
Session 2: July 14 - August 4
For more information on employment opportunities see www.cty.jhu.edu/jobs/summer

April is Math Awareness Month

The American Mathematical Society, the American Statistical Association, the Mathematical Association of America, and the Society for Industrial and Applied Mathematics announce that the theme for Mathematics Awareness Month, April 2012, is Mathematics, Statistics, and the Data Deluge.

For additional information check out: http://www.maa.org/pubs/mam2012.html

Program in Industrial and Systems Engineering (ISyE)

The University of Minnesota recently established an independent program in Industrial and Systems Engineering. The ISyE program offers MS and Ph.D. degrees. According to the Minnesota Department of Employment and Economic Development, Industrial Engineering is a

Comps Announcement

Attention Juniors, there will be a meeting to discuss upcoming Comps projects on Thursday May 3rd, 4pm, CMC 206.
high-growth / high-pay occupation in the state of Minnesota. The ISyE program will hold an information session for prospective students on April 27, 2012. If interested, contact John Gard-ner today at jgardner@me.umn.edu

PROBLEMS OF THE WEEK

1. Here is a synopsis of the rules of our current tournament game, Blokus™. Four players take turns putting pieces on the grid squares of a 20 × 20 square board (which is divided into 400 grid squares). The 21 pieces available to each player are all of one color, and their shapes are the possible shapes that can be formed by connecting from one to five grid squares along their edges: the “free polyominoes” with one to five squares (see, for instance, http://mathworld.wolfram.com/Polyomino.html). The reflected version of such a polyomino is not considered different; any piece can be put down in any orientation (in particular, it can be flipped over) as long as it covers the appropriate number of grid squares, but once a piece is placed it cannot be moved. Each player’s first move must cover a corner square of the grid, so they all start in different corners. After that first move, any piece put down may not have an edge in common with any previous piece of the same color, but it must have a vertex (corner) in common with at least one previous piece of the same color. When no such move is available, the player must stop playing; when everyone is out of moves, the winner is the player whose pieces cover the largest number of grid squares.

As the name of the game (pronounced “blockus”) suggests, in typical play the players will try to use their pieces to block possibilities for the other players. However, it is also possible to play cooperatively, and then it is possible to get all the pieces (of all four colors) on the board. (This requires a rather efficient packing of the pieces; only 44 of the 400 grid squares will be vacant.) Here is the problem: Is it possible to play Blokus legally so that the final configuration not only has all 84 pieces on the board, but also has at least one non-trivial symmetry (rotation or reflection), where for the purpose of the symmetry (but not while playing the game) colors are disregarded? If so, show how this can be done. If not, show why not.

2. a) Evaluate

\[ \sum_{n=3}^{\infty} \frac{1}{n^3 - n^2 - 2n} . \]

b) Show that if \( F(n) \) is any polynomial of degree \( d \geq 2 \) whose coefficients are integers and whose \( d \) roots are all distinct integers, and if \( k \) is an integer greater than all those roots, then

\[ \sum_{n=k}^{\infty} \frac{1}{F(n)} \]

is a rational number.

Last week’s first problem was solved (as specified, without technology) by John Snyder in Oconomowoc. The second problem was solved by Justin Troyka, who should collect a B.B.O.P. item some time. So should Ben Strasser, who solved the second problem posed April 6. As for the first problem posed that week, essentially correct solutions arrived from John Weiss and from Andrew Gainer (who will be teaching in our department next year!); there was also an unsuccessful attempt. Good work, problem solvers!

- Mark Krusemeyer

Editors: Leo Betthauser Deanna Haunsperger
Problems of the Week: Mark Krusemeyer
Subscriptions & Web: Sue Jandro